PERPUSTAKAAN KAMPUS KESIHATAN
UNIVERSITI SAINS MALAYSIA

RUJUKAN

Laporan Akhir Geran Penyelidikan Jangka Pendek

Dr. Ahmad Sukari Halim

A Pilot Study of Ankle Instability Following Long Segment Fibular Graft Harvesting

Semua laporan kemajuan dan laporan akhir yang dikemukakan kepada Bahagian Penyelidikan dan Pembangunan perlu terlebih dahulu disampaikan untuk penelitian dan perakuan Jawatankuasa Penyelidikan di Pusat Pengajian.

USM JP-06

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Laporan Akhir Projek Penyelidikan Jangka Pendek

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Nama Penyelidik-Penyelidik Lain:
(*Jika berkaitan*)

DR. ZULMI WAN

DR. MAHAYIDDIN MUHAMAD

DR. MOHD YUSOF IBRAHIM

2) **Pusat Pengajian/Pusat/Unit:** PUSAT PENGAJIAN SAINS PERUBATAN/ UNIT SAINS REKONSTRUKTIF

3) **Tajuk Projek:** A PILOT STUDY OF ANKLE INSTABILITY FOLLOWING LONG SEGMENT FIBULAR GRAFT HARVESTING

4. (a) **Penemuan Projek/Abstrak**

(*Perlu disediakan makluman diantara 100-200 perkataan di dalam Bahasa Malaysia dan Bahasa Inggeris, ini kemudiannya akan dimuatkan ke dalam Laporan Tahunan Bahagian Penyelidikan & Pembangunan sebagai satu cara untuk menyampaikan dapatan projek tuan/puan kepada pihak Universiti.*)

LIHAT LAMPIRAN A - BAHASA MALAYSIA

B - BAHASA INGGERIS

(b) **Senaraikan Kata Kunci yang digunakan di dalam abstrak:**

Bahasa Malaysia	**Bahasa Inggeris**
KESTABILAN SENDI	ANKLE INSTABILITY
KAWASAN PENDERMA	DONOR SITE
MORBIDITI SENDI	ANKLE MORBIDITY
PERGELANGAN KAKI	
GRAF FIBULA	FIBULAR GRAFT

5. **Output Dan Faedah Projek**

(a) **Penerbitan** (*termasuk laporan/kertas seminar*)
(*Sila nyatakan jenis, tajuk, pengarang, tahun terbitan dan di mana telah diterbitkan/dibentangkan*)

1) PEMBENTANGAN KERTAS DAN ABSTRAK

" CLINICAL AND RADIOGRAPHIC ASSESSMENT OF ANKLE MORBIDITY FOLLOWING A LONG SEGMENT FIBULAR RESECTION "

2) PEMBENTANGAN KERTAS DAN ABSTRAK

" CLINICAL AND RADIOGRAPHIC EVALUATION OF ANKLE INSTABILITY FOLLOWING LONG SEGMENT FIBULA HARVESTING "

3) PEMBENTANGAN KERTAS SERTA PROCEEDING

" CRITICAL CLINICO-RADIOGRAPHICAL ASSESSMENT OF ANKLE AFTER FREE FIBULA TRANFER "

(RUJUK LAMPIRAN - 1,2 DAN 3)

(b) **Faedah-Faedah Lain Seperti Perkembangan Produk, Prospek Komersialisasi Dan Pendaftaran Paten**

(*Jika ada dan jika perlu, sila gunakan kertas berasingan*)

BERASASKAN HASIL KAJIAN INI PIHAK KAMI TELAH DAPAT MENGHASILKAN SUATU BUKTI SERTA PENERANGAN SAINTIFIK BERKAITAN MASALAH KETAKSTABILAN SENDI PERGELANGAN KAKI SELEPAS GRAF FIBULA DIAMBIL. DENGAN INI SUATU GARIS PANDUAN TELAH DIHASILKAN DALAM MENJALANKAN PROSEDUR INI.

(c) **Latihan Gunatenaga Manusia**

i) Pelajar Siswazah: PELAJAR SISWAZAH SARJANA PERUBATAN/ (ORTOPEDIK) DR. MOHD YUSOF IBRAHIM.

DISERTASI BERTAJUK "CLINICAL AND RADIOLOGICAL EVALUATION OF THE ANKLE MORBIDITY FOLLOWING LONG SEGMENT FIBULAR GRAFT HARVESTING.

ii) Pelajar Prasiswazah:

iii) Lain-lain:

6. **Peralatan Yang Telah Dibeli:**

1) PERALATAN PAKAI HABIS

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- BATERI
- CD

2) ASET - TIADA

3) PERKHIDMATAN

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- HONORARIUM PESAKIT
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PROF. MADYA ZABIDI AZHAR MOHD. HUSSIN
Dekan
Pusat Pengajian Sains Perubatan
Universiti Sains Malaysia
16150 Kubang Kerian,
Kelantan.

No. 4. (a) Penemuan Projek/ Abstrak

Lihat lampiran A- Bahasa Malaysia
B- Bahasa Inggeris

A) ABSTRAK

" Kajian Pilot Ketakstabilan Sendi Pergelangan Kaki Selepas Pengambilan Graf Segmen Panjang Tulang Fibula"

B) ABSTRACT

" A Pilot Study of Ankle Instability Following Long Segment Fibular Graft Harvesting"

ABSTRAK

KAJIAN PILOT KETAKSTABILAN SENDI PERGELANGAN KAKI SELEPAS PENGAMBILAN GRAF SEGMEN PANJANG TULANG FIBULA

Graf fibula adalah satu teknik untuk mengembalikan keutuhan tulang rangka akibat kecacatan tulang. Walaupun teknik ini amat berguna, namun banyak lapuran berkaitan dengan isu pengambilan tulang fibula ini terutamanya berkaitan ketidakstabilan sendi pergelangan kaki.

Ini adalah kajian kohort keatas pesakit-pesakit yang telah menjalani pengambilan graf segmen panjang tulang fibula sekurang-kurangnya 15 sm. Seramai sepuluh pesakit berumur 12 hingga 64 tahun terlibat dalam kajian ini. Sepuluh pasang kaki telah diperiksa dengan kaki sebelah berlawanan (kontralateral) yang normal sebagai kontrol (20 kaki semuanya). Kajian objektif berkaitan morbiditi sendi pergelangan kaki adalah berdasarkan sistem skore kaki Maryland (Maryland Foot Score). Kajian radiologi termasukalah pengambilan X-ray secara pandangan sidesmosis sendi pergelangan kaki untuk kedua-dua keadaan, semasa berdiri dan semasa berbaring. Imej CT scan secara melintang di kedudukkan 9 mm diatas plafond tulang tibia dikaji dan pengukuran jarak sindesmosis depan dan belakang dijalankan. Analisis keatas simptoms-simptom subjektif menghasilkan markah diantara 78 hingga 99% berdasarkan analisis menggunakan system permarkahan kaki Maryland (Maryland Foot score scoring system). Perubahan osteoporosis keatas baki tulang fibula distal sebelah kaki kawasan penderma terjadi sebanyak 89 % daripada keseluruhan subjek kajian.

Walaupun perubahan-perubahan radiologi keatas baki tulang fibula hujung dan sendi pergelangan kaki adalah signifikan, tetapi analisis symptom-simptom yang subjektif keatas morbiditi sendi pergelangan kaki memberikan keputusan yang bagus atau memberansangkan (excellent). Markah analisis keatas simptom-simptom subjektif adalah menurun apabila baki tulang fibula hujung adalah kurang daripada 5.5 cm. Meninggalkan tulang fibula hujung dengan baki sekurang-kurangnya 7 cm adalah dicadangkan untuk mengurangkan simptom-simptom ketakstabilan sendi pergelangan kaki.

ABSTRACT

A PILOT STUDY OF ANKLE INSTABILITY FOLLOWING LONG SEGMENT FIBULAR GRAFT HARVESTING

Fibular graft is a useful technique to restore skeletal integrity of bony defects. Despite the benefits of this procedure, there are reported problems associated with donor site, particularly with regards to ankle stability.

A cohort study was performed on patients who had undergone long segment fibular graft resection of minimum 15 cm in length. A total of ten patients ranging from 12 to 64 years old were included in the study .The assessment performed after a minimum of 4 months following the operation. Ten pairs of legs were evaluated with contralateral normal legs as control (a total of ten legs). The objective assessment of ankle morbidity was done based on Maryland Foot scoring system. Radiological assessments included plain radiograph in syndesmotic views, on both non-weight bearing supine position and weight bearing standing position. The axial CT scan slice done at the level of 9 mm above the tibial plafond was assessed to measure the anterior and posterior syndesmotic interval. Subjective assessments revealed score ranging from 78 to 99% according to Maryland Foot scoring system. Osteoporosis of distal fibula of the donors' side was present in 89 %.

Despite the significant radiological changes of the residual distal fibula and the ankle, the subjective assessment of the ankle morbidity yielded good or excellent results. The residual distal fibula of 5.5 cm or less was associated with

a low score of less than 85%. Leaving a minimum of 7 cm length of the residual distal fibula is advisable to minimize symptoms of ankle instability.

No. 5.(a) Output dan Feadah Projek

(Rujuk Lampiran – 1, 2 dan 3)

1) **Pembentangan Kertas dan Abstrak**

" Clinical and Radiographic Assessments of Ankle Morbidity Following a Long Segment Fibular Resection"

M. Yusof , A.S Halim, M. Mahayuddin & Zulmi Wan

1st Asean Conference on Medical Sciences 18 – 21 May 2001
Ballroom, Renaissance Kota Bharu Hotel

2) **Pembentangan Kertas dan Abstrak**

" Clinical and Radiographic Evaluation of Ankle Instability Following Long Segment Fibula Harvesting"

AS Halim, M Yusof, M Mahayuddin , Zulmi Wan

Association & College of Surgeons, Academy of Medicine of Malaysia
24 – 27 May 2001
Santubong Kuching Resort, Sarawak.

3) **Pembentangan kertas serta Proceeding**

" Critical Clinico-radiographical Assessment of Ankle after Free Fibula Transfer"

Halim AS, Ibrahim MY, Mohamad M, Zulmi Wan

Inaugural Congress the World Society for Reconstructive Microsurgery
October 29 – November 3, 2001
Taipei , Taiwan.

Book of Abstracts

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DR. AHMAD SUKARI HALIM
Coordinator
Lecturer
Reconstructive Sciences Unit
School of Medical Sciences
Universiti Sains Malaysia
16150 Kubang Kerian,
Kelantan.

1ST ASEAN CONFERENCE ON MEDICAL SCIENCES
18 - 21 MAY 2001

Abstract No. O-26

THE VALUE OF CONTRAST MEDIUMIN CRANIAL COMPUTED TOMOGRAPHY IN PATIENTS WITHOUT FOCAL NEUROLOGICAL FEATURES (PRELIMINARY REPORT)

Win Mar & Mahayiddin Mohamed
Department of Radiology, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.

The value of contrast enhancement during cranial computed tomography (CT) is well known. Contrast enhancement has been regarded as unhelpful in patients in whom the uncontrasted scan is entirely normal. It is only helpful in limited numbers of patients with symptoms and signs suggesting focal intracranial pathology. This study was done to assess the value of contrast medium administration in patients presenting with generalised features without focal neuorological signs. The study was done both retrospectively and prospectively. The patients with above features who had boh non-contrasted CT scan (NCCT) and contrast-enhanced CT scan (CECT) were recruited. Only the NCCTs were shown to the radiologist and phase II radiology residents. The target sample is 212 cases and about 100 cases had been analysed. There were five abnormal cases out of 100. Intravenous contrast enhancement only contributes to the diagnosis if suspicious abnormality is seen on NCCT (5%). In remaining patients (95%) there is no diagnostic contribution. Both sensitivity and specificity for the radiologist was 100% and 96.8% respectively, and for the medical officers were 100% and 93.7-97.9%. Intravenous contrast enhancement is unlikely to be of value in those patients without focal neurological features and who have a normal uncontrasted scan. However, a reduction in the use of contrast medium in patients with focal treatable lesions being missed and therefore it still has an important but limited role.

Abstract No. O-27

ENHANCING FAT SATURATION TECHNIQUE IN MRI

W.A. Kamil A. Sobri & Khalid Osman
Department of Radiology, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia.

This presentation will highlight the rinciples of fat saturation method, some new adjustment parameters that had been determined and the resulting enchanced images obtained using MRI facilities at Universiti Sains Malaysia Hospital.

The technique of at saturation in MRI examination is an excellent choice to exclude fatty tissues from the vicinity of suspected soft tumor. Routine exmaination uses a set of pre-determined scan parameters available on the instrument console, assuming that the magnetic field homogeneity for large field-of-view (FOV) is shimmed properly. In practical case where the external magnetic field at the firnge of FOV is not quite homogeneous, adjustments have been made and tailored to the new field situation due to the presence of a subject undergoing MRI examinttions.

Two sets of MRI images were obtained by selecting firstly, the automatic fat suppression format and secondly, using the manual method. In the manual mode, several values of RF pulse were within an acceptable range. Comparison was made between the two sets of results.

Images obtained by inserting manually the value of an RF pulse to suppress the fat were found to be significantly better than the images acquired automatically. Fine-tuning the RF pulse value is necessary because of small disturbance in the magnetic field homogeneity due to the presence of a patient in the MRI chamber.

Abstract No. O-28

CLINICAL AND RADIOGRAPHIC ASSESSMENTS OF ANKLE MORBIDITY FOLLOWING A LONG SEGMENT FIBULAR RESECTION

M. Yusof A.S. Halim, M. Mahayuddin & Zulmi Wan
Hospital Universiti Sains Malaysia, Kubang Kerian, Kelantan, Malaysia

Fibula graft is a useful technique to restore skeletal integrity of bony defects. Despite the benefits of this procedure, there are problems associated with donor site, particularly with regards to ankle stability.

Objective: To determine the clinical signs and symptoms, as well as radiographic findings and their correlation with ankle stability.

A cohort study was carried out on patients who had undergone long segment fibula graft harvesting. A total of nine patients were included in the study. Nine pairs of legs were evaluated with contralateral normal legs as control. Evaluation was based on interviews and physical examination. Radiological assessments included plain radiograph and CT scan.

Subjective assessments were based on Maryland foot score which revealed score ranging from 78 to 99%. The range of ankle motion was decreased on loaded dorsiflexion in 2 patients but range in loaded plantar flexion were all normal. Based on the X-rays findings, the distal residual length of fibula were ranged from 5.0 cm to 11:0 cm. The abnormalities detected on plain radiograph were proximal migration of the fibula and medial tilt of the distal residual fibula proximal to the ankle (*tilting angle of fibula*). The CT scan study was for assessment of distal tibio-fibula syndesmosis for evidence of widening and rotation of the fibula at the syndesmotic level. The correlation between the Maryland foot score and radiological findings with the residual length of distal fibula was assessed.

There is minimal ankle morbidity following a long segment fibula graft harvested despite the radiological findings of increased tilting angle of fibula and proximal migration of the fibula.

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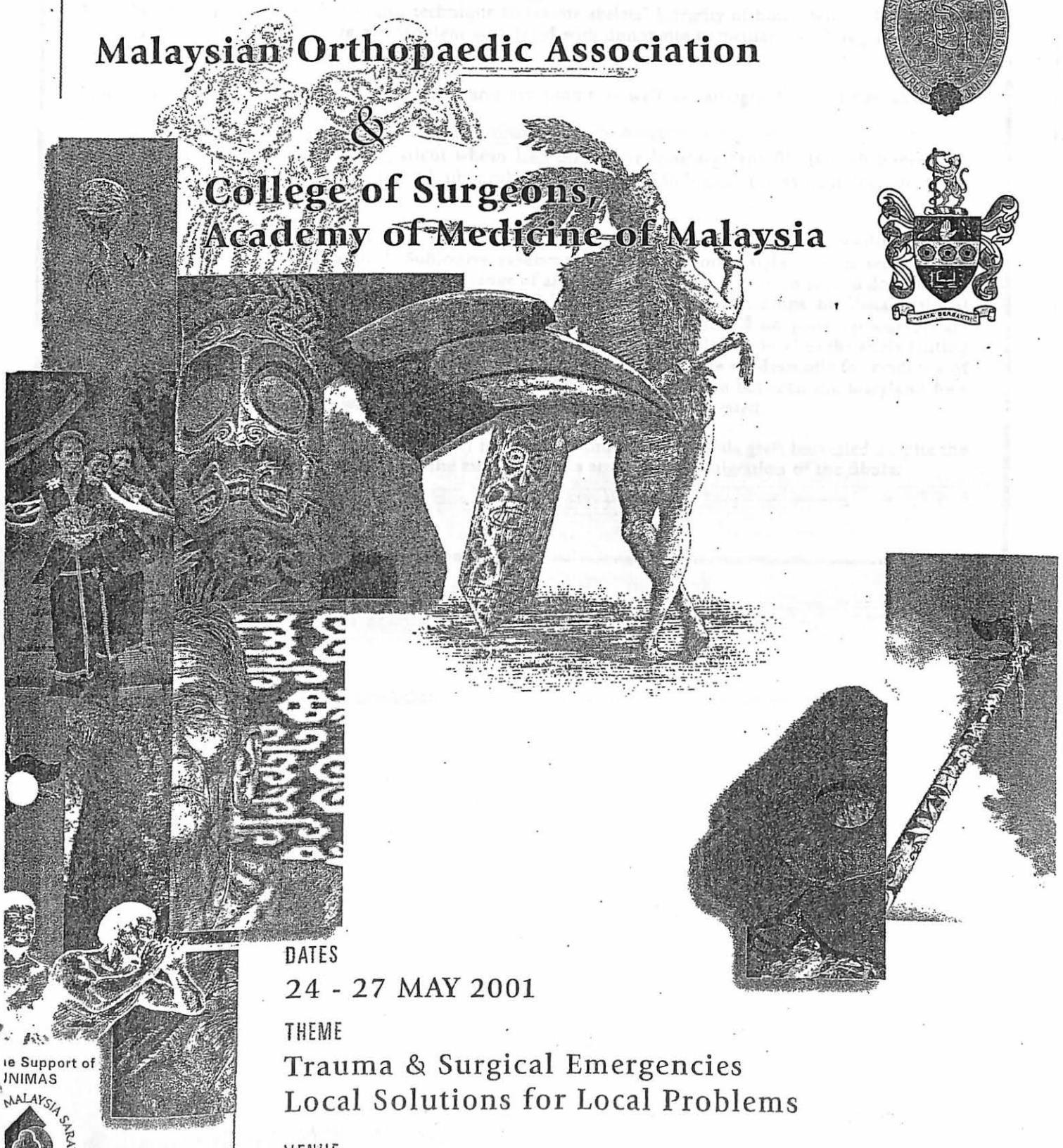

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SOUVENIR PROGRAMME & ABSTRACT BOOK

CLINICAL AND RADIOGRAPHIC EVALUATION OF ANKLE INSTABILITY FOLLOWING LONG SEGMENT FIBULA HARVESTING

AS HALIM, M YUSOF, M MAHYUDDIN, ZULMI WAN
Department of Orthopaedic Surgery, Universiti Sains Malaysia, Kubang Kerian, Kelantan.

Introduction : Fibula graft is a useful technique to restore skeletal integrity of bony defects. Despite the benefits of this procedure, there are problem associated with donor site particularly with regard to ankle instability.

Objective : To determine the clinical signs and symptoms as well as radiographic findings and their correlation with the ankle instability

Methodology : A cohort study on patient whom had undergone long segment fibula graft harvesting. Evaluation was based on interview and physical examination, radiological assessment include plain radiograph and CT scan

Results : A total of nine patients were included in the study. Nine pairs of legs were evaluated with contralateral normal legs as control. Subjective assessment were based on Maryland Foot score which revealed of score ranging from 78 to 99%. The range of ankle motion was decreased on loaded dorsiflexion in 2 patients but loaded plantar flexion were all normal. Based on the X-rays findings, the distal residual length of fibula were ranges from 5.0cm to 11.0cm. The abnormality detected on plain radiograph are proximal migration of the fibula and medially tilt of the distal residual fibula proximal to the ankle (tilting angle of fibula). The CT scan study were for assessment of distal tibio-fibula syndesmotic for evidence of widening and rotation of the fibula at the syndesmotic level. The correlation between the Maryland foot score and radiological findings with the residual length of distal fibula is assessed.

Conclusion : There is minimal ankle morbidity following a long segment fibula graft harvested despite the radiological findings such as increased tilting angle of fibula and proximal migration of the fibula.

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Bologna, August 6, 2001

Dr. Ahmad Sukari Halim
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Malaysia

RE: Inaugural Congress of the World Society for Reconstructive Microsurgery
Taipei, Taiwan, October 29-November 3, 2001

Dear Doctor Halim,

We would like to inform you that we have been appointed to publish the proceedings of the above mentioned congress.
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! Allograft Transplantation ! Basic Research ! New Technology ! Miscellaneous

Title	**CRITICAL CLINICO-RADIOGRAPHICAL ASSESSMENT OF ANKLE AFTER FREE FIBULA TRANFER**
Author	Halim AS* , Ibrahim MY**, Mohamad M***, Zulmi Wan* *Reconstructive Sciences Unit **Orthopedic Department***Radiology Department

Presenting Author/ Department/ Institution/ City/ Country

Halim AS, Reconstructive Sciences Unit
School of Medical Sciences USM , 16150 Kubang Kerian, Kelantan, Malaysia.

Introduction
The vascularised fibula graft transfer is a useful procedure and represent the state-of art technique to restore skeletal integrity for congenital or traumatic defects and following oncological resection. Despite the well-documented benefits , there are morbidity associated with this procedures. Ankle instability is one of the major concern following the harvesting of the long segment fibula.

Aim of study
1. To objectively assess clinically the associated ankle morbidity.
2. To determine radiographic changes of the ankle following fibula harvesting.
3. To define the correlation between the function , radiographic changes and the residual fibula function

Methodology
A cohort study on patient who underwent fibula harvesting with minimum length of 15 cm and a normal contralateral ankle.The assessment was performed at least 4 month after fibula harvesting. Maryland Foot Score scoring system was used to objectively analyze the symptoms. Clinical and radiological examination including plain AP view, mortise view, syndesmotic view and axial CT scan of the ankle was also performed.

Result
A total of nine patients , age ranges from 12 to 64 years fulfilled the inclusion criteria. The post operative duration ranges from 4 to 40 months . Six cases are for mandibular reconstruction and three cases are for upper limb reconstruction. The mean length of the harvested fibula is 18.6 cm (range : 15- 23 cm) Distal residual length of the fibula is 8.2 (range : 5-11 cm).Five patients (56%) had excellent result (MFS 90-100) while four had good result (MFS 75-89). The two patients with the shortest residual fibula (5 and 5.5) had the lowest score (78 and 83) respectively. All other patients with distal residual length of more than 7 cm had a score of more than 85 . There is a decreased in range of movement of ankle dorsi and plantar flexion. The proximal migration of lateral malleolus of the donor's ankle from the NWB to WB position and widening of the tibia-fibular syndesmosis is noted to be statistically significant.

Discussion
A significant radiological changes was noted with proximal migration of distal residual fibula which further increase with weight bearing. However despite the radiographical changes , the subjective assessment of the ankle was good to excellent. The score correlated well with the distal residual fibula length. Maryland Foot Score is a useful tool in evaluating ankle morbidity following free fibula graft harvesting.

Abstract Text (Print or Type in this space only, font size10)

If not accepted for oral presentation, would you accept as a poster? ! Yes ! No

CRITICAL CLINICO-RADIOGRAPHICAL ASSESMENT OF ANKLE AFTER FREE FIBULAR TRANSFER

AS Halim*, MY Ibrahim**, M Mohamad*, Z Wan*

*Reconstructive Sciences Unit
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School of Medical Sciences USM, 16150 Kubang Kerian, Kelantan, Malaysia

Summary

A cohort study was performed on patients who had undergone long segment fibular graft resection of minimum 15 cm in length. Nine pairs of legs were evaluated with contralateral normal legs as control. Despite the significant radiological changes of the residual distal fibula and the ankle, the subjective assessment of the ankle morbidity yielded good or excellent results.

Introduction

The vascularized autogenous fibular graft represents a state-of-the art technique to restore skeletal integrity for long segment bony defects following trauma or tumor excision. Despite the well-documented benefits of this procedure, there are problems associated with this technique. Ankle instability is one of the major concerns following the resection of fibular graft. There are many studies which have tried to relate the incidence of this complication with the residual length of distal fibula. Ankle instability following a resection of long segment fibular graft is related to the extremely short residual distal fibula length, often less than 6-8 cm. There is no explanation given to the causes of instability. However, a constant observation in short residual fibular length following fibula harvesting shows a proximal migration of fibula. Thus, the purpose of this study is to objectively measure the effects of functional daily activities to the patient and radiographic changes on the ankle joint particularly distal tibiofibular syndesmosis and residual distal fibula following a long segment fibular graft harvesting.

Materials and methods :

A cohort study was performed on patients who had undergone long segment fibular graft resection of minimum 15cm in length. A total of nine patients ranging from 12 to 64 years old were included in the study and the assessment done after a minimum of 4 months following the operation. Nine pairs of legs were evaluated with contralateral normal legs as control. The assessment for ankle morbidity was based on interviews and physical examinations. The objective assessment for subjective symptoms of ankle morbidity was done based on the Maryland Foot Scoring System. Radiological assessments included plain radiograph in syndesmotic views, on both non-weight bearing supine position and weight bearing standing position. The

distance of the tip of lateral malleolus in relation to the tip of medial malleolus was assessed. The tilting angle of the residual distal fibular was measured. The axial CT scan slice done at a level of 9 mm above the tibial plafond was assessed to measure the anterior and posterior syndesmotic interval. The average of these two intervals was used as the syndesmotic interval of the ankle , whereas the difference was used to determine the rotation of the fibula. A comparison was made with the contralateral normal ankle. Statistical analysis using student-t test was performed to assess the results of the donor's ankle as compared to the normal ankle.

Results

Subjective assessments revealed a score ranging from 78 to 99% according to the Maryland Foot Scoring System. The average plantar flexion of the donors' ankles was 46.33^0 , compared to the normal ankles of 48.11^0. The average range of loaded dorsiflexion of the donors' ankles was 27.78^0 compared to 30.89^0 of the normal ankles. Osteoporosis of distal fibula of the donors' side was present in 89%. In normal ankles, the tip of lateral malleolus was distal than the tip of medial malleolus with an average of 9.22mm during non-weight bearing, increasing to 11.33mm with weight bearing. In donors' ankles, the tip of the lateral malleolus was also distal than the tip of medial malleolus but with an average of 7.33mm during non-weight bearing and further decreasing to 6.56mm on weight bearing. The mean tilting angle of distal fibula of normal legs on syndesmotic view of plain radiograph was 90.33^0 with non-weight bearing increasing to 91.67^0 with weight bearing. However, the mean tilting angle for distal fibula of donors' legs on syndesmotic view of plain radiograph was $90.11^0$with non-weight bearing but decreased further to 88.22^0 with weight bearing. Both normal and donors' ankles had posterior syndesmotic interval greater than anterior interval. The average width of tibiofibular interval at 9mm above the tibial plafond of normal ankles was 2.939mm, whereas the donors' ankle was 3.500mm. The average difference of anterior and posterior interval in the normal ankles was 1.700mm and 2.022 mm for the donors' ankles.

Conclusion

There were significant radiological changes of the ankle following a long segment fibular graft resection. The proximal migration of the residual distal fibula occurred and further during weight bearing. The tilting angle of fibula decreased while weight bearing. The syndesmotic interval also widened due to lateral displacement of the fibula following a long segment fibular graft resection but no rotation of fibula was noted.

Despite the above-mentioned radiological changes, the scoring marks for the subjective assessment of the ankle morbidity were either good or excellent with the minimum residual distal fibula of 5.0cm.However, leaving a minimum 7 cm length of the residual distal fibula is suggested to minimize the symptoms of ankle instability as its correlates with the Maryland Foot score above 85%.

References

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